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REPORT OF MOUNTAIN PINE BEETLE SITUATION IN CRATER LAKE NATIONAL PARK FALL 1930

By

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501 Lewis Building
Portland, Oregon
December 1, 1930

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ABSTRACT

The protection of the lodgepole pine forests in the southern half of Crater Lake Park from the danger of complete destruction by the mountain pine beetle has engaged the attention of the National Park Service and the Forest Service and the Bureau of Entomology for the past five years. The tide of the control battle has ebbed and flowed, but now the ultimate victory is in sight.

The infestation north of the Lake was first noticed in 1923. In 1925 the first control work was started. In 1926 a heavy migration of beetles from the epidemic centers north of the Lake nearly swamped the results of the control work to the south. However, reclearing these areas in 1927 brought the situation again under control in 1928. The 1929 infestation was again heavy, due to migrations, in fact the heaviest reinfestation since the work started, and 23,544 trees were treated in the Park areas.

Reclearing work was continued in 1930 and 8,947 trees treated, but the heavy center on the Middle Fork-East Fork plateau was not completed, and many of these beetles have escaped causing new infestation centers on Crater Peak ridge and near the south entrance.

The past control work has shown an average reduction of about 75 per cent where units were thoroughly treated and not reinfested by long distance migrations. The 1929 work was particularly successful, and the 1930 work should give even better results since the sources of beetle migrations are now completely exhausted.

The Park areas are now in good shape except for the two new units and the unfinished Middle Fork-East Fork plateau unit. Reclearing is also recommended for the more intensively used areas, such as the east entrance, Anna Spring, Munson Valley, and the Rim.

It is estimated that a total of 10,000 trees will need to be treated in the spring of 1931 on the Park areas, for which an allotment of $10,000 is requested. On adjacent National Forest areas, about 1,500 trees may need to be treated at a cost of about $1,500. If this amount of work is concluded in the spring of 1931, no further control work should be required for several years.

INTRODUCTION

The protection of the pine forests of Crater Lake National Park from destruction by the mountain pine beetle has engaged the attention of the National Park Service, the Forest Service, and the Bureau of Entomology for the past five years.

Before this control campaign started, the beetles had made serious inroads into the lodgepole stands at the north end of the Park, and had secured a firm foothold in the forests to the south.

The tide of the control battle has ebbed and flowed. The control forces have given the enemy repeated setbacks, but until recently the beetles on the southern front have had their forces strengthened by reinforcements from the north. The northern reserves are now depleted, and the remnants of the beetle army are widely dispersed and rendered ineffective with only a few concentrated groups operating in territory outside the former battlefields. The ultimate victory is now in sight.

HISTORY OF THE INFESTATION

A reconnaissance of the Park made by members of the Bureau of Entomology in the summer of 1925 revealed a serious barkbeetle infestation in the lodgepole stands. Subsequent surveys indicated that beetle losses on certain areas had been continuous for at least ten years.

Apparently the epidemic originated in the National Forest stands northeast of the Park near Diamond Lake, and slowly spread southward killing from 50 per cent to 90 per cent of the stand as it progressed.

In 1925 when the first control work was undertaken, the epidemic had swept through the lodgepole stands to the north leaving only a few active areas. To the east and to the west the epidemic was at its height, and thousands of trees were infested. In the recreational areas to the south there were a few new active centers, and it was upon these "spot infestations" that the control work was concentrated. During the spring of 1925, the Park Service treated 4,291 trees on 5,000 acres located in the Pinnacles Valley, Munson Valley, and near Anna Springs.

In the spring of 1926 these same units were recleaned and 1,713 lodgepole pines treated on about 3,000 acres. In the fall of the same year, the Park Service again recleaned the Munson Valley unit and treated 756 trees.

From May to July of 1927 these units were again recleaned by the Park Service, and 2,936 trees treated on about 4,000 acres inside the Park; while 4,000 trees were treated by the Forest Service on National Forest lands adjacent to the Park in the Sand Creek Area. Following this work, Patterson reported the south side areas completely under control, and that no further work would need to be done for a few years.

In line with this recommendation no control work was done inside the Park during 1928, but in the spring of that year, the Forest Service

reclaimed their area on Sand Creek, treating 1,815 trees on about 480 acres.

However, the east and west areas were still active, and so in the fall of 1928 enough infestation was found to warrant the resumption of control operations, and in the spring of 1929 this work was resumed with the idea that only 4,500 trees would need to be treated. However, after the control work got under way, 17,086 trees were found on the units recommended for control and a new area with 10,760 trees was discovered in the middle of the south side areas. In other words, 1929 represented the peak of the attack from beetles migrating from the east, north, and west areas. The control work conducted in 1929 brought about good results on the units which were completely covered, and a 74 per cent reduction was secured on all such units. On the Middle Fork-East Fork unit only 60 per cent of the infestation was treated and a reduction of 36 per cent secured.

The season of 1930 found the east and west centers largely played out and the south side under control, except for the new area between the Middle Fork and East Fork of Anna Creek. During the spring control work, the old areas of the Castle Creek and Anna Creek areas were reclaimed and most of the infestation on the Middle Fork-East Fork plateau treated. However, a total of 1,897 trees or about 27 per cent of the infestation on this unit was again left due to the emergence of the beetles.

The work performed during these years is summarized in Table 1.

CONTROL WORK AND COST, SEASON OF 1930

Spring opened nearly a month earlier than usual in Crater Lake National Park, and even in April the roads were free from snow as far as Anna Spring. As a consequence the beetle control camp opened under very favorable circumstances, but considerable stormy weather hampered the work during the remainder of the season.

On May 14 the control crew was organized. This consisted of camp foreman, one compassman, two spotters and seven treating crews of three men each. Camp was established at government headquarters, where the men were quartered in the new mess hall. Meals were served by the general mess, and the charges deducted from the men's wages. Chief Ranger Wm. Godfrey was in charge of the project, Mr. Fred Patton was foreman in charge of the crews, and Mr. Frank Solinsky ran compass and directed the work of the spotting crew. Mr. Buckhorn of the Bureau of Entomology assisted in training the spotters and supervised the treating work until May 23.

Control work started on May 15 in the old infested areas on Whitehorse and Castle Creek, and proceeded south and east through the other units.

Table No. 1

SUMMARY OF CONTROL WORK PERFORMED

Year and Season	Treated by	Units Treated	Treated: Trees	Treated: Acres	Treated: Cost	Left Untreated
1925 Spring	Park Service	A, B, C, D, E, F, G	4,291	5,000	$5,761.64	500,000 trees on 22,000 acres and vast area outside of Park
1926 Spring	Park Service	A, B, C, D, E, F, H, I, J	1,756	3,900	1,833.84	East of epidemic centers, north of Lake. Heavy losses outside
1926 Fall	Park Service	F, I	756	1,300	1,060.03	New attacks in units F, I, M, N, O
1927 Spring	Park Service	A,B,C,D,E,F, G,H,I,K	2,936	4,300	2,500.00	Active epidemic in east and west areas.
	Forest Service	SC	4,000	1,400	3,000.00	South areas under control
1928 Spring	Forest Service	SC	1,257	430	1,138.75	Active epidemic to east and west. Some reinfestation on controlled units
1929 Spring	Park Service	A,B,C,D,E,F, G,H,I,K,L,M, N,O	23,844	6,055	18,600.00	4,831 trees left on Unit N. Declining epidemic to east and west. Endemic infestation in remainder of Forest
	Forest Service	SC	3,116	2,197	2,473.84	
1930 Spring	Park Service	F,G,H,I,K, L,M,N,O,P,Q	9,947	5,000	6,710.12	1,897 trees left on Unit N 400 trees left on Unit K New centers found on Crater Ridge and near south entrance

The control methods used were similar to those used in previous years. Lodgepole pines were felled in a north and south direction and the branches lopped. They were then left exposed to the sun's rays, which are very effective at this latitude in killing the beetles under the bark during the warm days of late June. Towards the end of the work, the crews returned and rolled the logs completely over so as to expose the bottom half. This method has been found more effective than the burning method since the beneficial insects are mobile and can escape. White pines on account of their thicker bark are completely peeled when first felled.

Up to June 11, the work was confined to the recleaning of the units treated in 1929 and some scattered infestation in new adjacent units. On June 11 the spotters and treaters moved into the heavy infestation on the Middle Fork-East Fork plateau, and from that time on the average number of trees treated per man day rapidly increased and the unit cost per tree correspondingly was lowered.

The work continued until July 8 when the work was closed on account of the emergence of the beetles at the lower altitudes. Up to that time 9,832 trees were treated and 1,897 trees left untreated (on the Middle Fork-East Fork plateau).

On July 21 Dr. Craighead and the writer visited the Park and inspected the treated areas. On Cloud Cap a number of infested whitebark pines were examined and found to still contain beetles in the larvae, pupae and new adult stages. Since these trees were at an elevation above 7,000 feet and the beetles had not emerged, Dr. Craighead recommended that the trees be treated. Following this recommendation, 115 of these infested trees were treated, of which 72 were whitebark pine and 43 were lodgepole, bringing the total for the season to 9,947 trees.

Amount of Work Accomplished

Table 2 shows the total amount of work performed on each of the south side units during the spring of 1930, and the total cost of this work.

Table No. 2
Control Work Performed by Park Service
Spring 1930

Area and Unit	Unit Symbol	Acres Covered	Trees Treated Spotted	Felled	Rolled
Anna Creek Area:					
Munson Valley	F, K	700	900	892	869
Anna Spring	G, X, Y	500	259	238	236
Middle Fork-East Fork	H	700	6,908	5,011	4,892
South Entrance	J	100	147	147	147
Castle Creek Area:					
Cascade Divide	L	600	480	498	490
White Horse	M, AM	500	874	897	880
Castle Valley	O-BO	1500	1,219	1,246	1,218
Castle Ridge	P	500	861	863	837
Rim Area:					
Cloud Cap		100	115	115	45
Total		5,000	11,793	9,947	9,650

Control Cost

Salaries	$6,493.50		
Supplies	30.29		
Transportation	155.83		
Meals	30.50		
Total	$6,710.12	Cost per tree	$0.675

NOTE: Difference between number of trees felled and rolled due to white pines which were completely peeled.

Difference between number of trees spotted and felled due to number left untreated on Unit H.

Segregating this work between new units and those previously treated, the totals are as follows:

	Trees Treated	Acres Covered	Trees per Acre
Reclaimed units	3,141	3,000	1.05
Partially treated	5,011	700	7.15
New Units	1,795	1,300	1.38
Total	9,947	5,000	1.99

The average cost per tree was $0.675

RESULTS OF PREVIOUS CONTROL WORK

Following all of the control work which has been done on the Park since 1925, good results always have been secured wherever the work was not submerged by the influx of beetles from heavy centers in nearby forests. Where second surveys are available to show the effect of the work, these have been listed in Table 3. Some of the best results were not followed by second surveys as often no reclaiming work was found necessary and therefore no detailed survey was made.

Now that the heavy centers north of the lake are no longer supplying beetles to reinfest the south side areas, we get an indication of what really can be expected from control work. Again referring to Table 3 it will be noted that the reductions secured on the units treated in 1929 were quite uniformly between 68 per cent and 75 per cent, an excellent example of what control against this beetle will actually do.

It is fully expected that the results from the 1930 campaign will be fully as satisfactory as from the 1929 work.

THE BEETLE MENACE IN LODGEPOLE STANDS

There is a very obvious difference in the susceptibility of lodgepole stands of different ages to barkbeetle attack.

Following forest fires in this region, lodgepole is the first tree to become reestablished, and often forms a very dense forest cover in the old burns. When the trees are young, less than fifty years of age, they are not selected for barkbeetle attack, and this immunity often lasts until the trees are over seventy-five years of age.

When the trees are from seventy-five to one hundred and fifty years old, they become very susceptible, and the mountain pine beetle epidemics develop in stands of this character. If control work is undertaken, the stands may be saved for many years, but if no work is done, the epidemic sweeps through the forest killing from 50 per cent to 95 per cent

Table No. 3
Results of Control Work

Area and Unit	Symbol	Number Trees Found Before	After	Per Cent Treated	Per Cent Reduction
Results from spring control of 1925					
Sand Creek Area:					
East Entrance	A	1,815	388	100 approx.	79
Sand Creek	B,C,D,	802	97	100 "	88
Kerr Notch	E	853	436	?	49
Anna Creek Area:					
Munson Valley	F	801	394	?	51
Results from spring control of 1926					
Sand Creek Area:					
East Entrance	A	388	93	100 approx.	76
Sand Creek	B,C,D	97	72	?	26
Kerr Notch	E	436	301	?	31
Anna Creek Area:					
Munson Valley	F	394	572	?	(45% increase*)
" "	I	324	2,546	?	(687 ")
Anna Spring	G	74	108	?	(46 ")
Results of spring control of 1927					
Sand Creek Area:					
National Forest		4,000	1,000*	100 approx.	75
Results of spring control of 1928					
Sand Creek Area:					
National Forest		1,257	546	100 approx.	57*
Results of spring control of 1929					
Completely Treated Units					
Anna Creek Area:					
Munson Valley	F,I,K	5,389	892	100 approx.	74
Anna Spring	G	732	237	"	68
East Anna Spring	X	79	21	"	73
Goodbye Bridge	M	111	30	"	73
Castle Creek Area:					
Cascade Divide	L	1,889	488	"	74
Whitehorse	M	3,653	897	"	75
Castle Creek	O	2,051	576	"	72
Partially Treated Unit					
Middle Fork-East Fork Plateau	N	10,760	6,908*	60	36

*Estimate from 33-1/3 per cent cruise

*Decrease influenced by considerable National Park lands not treated

*The increase in these units was without much doubt due to migrations of the beetles from the infested areas north of the lake.

*The 1930 infestation on Unit N equaled 1.6 times the amount left untreated in 1929, i.e. 4,351 trees

of the pines.

On sites adapted to fir and hemlock these species usually come in under the dead pine forests and in time cover the scars with a type of forest well suited as a forest cover for Park purposes. In later years the few old pines surviving in these mixed stands are gradually killed out by the beetles and a pure fir and hemlock forest becomes the climax type. In other places, usually at the lower elevations or where the mineral soil is lacking in humus, lodgepole reproduction again becomes established and a second pine forest with a sprinkling of old trees is the result.

On the map attached to this report the character of the present pine stands is indicated, and the photographs illustrate the conditions as to reproduction in various parts of the Park.

In the younger stands beetle control does not need to be considered as yet. In the mixed forests infestations are only of importance when they serve as breeding grounds for epidemics in the pure stands, or in areas of intensive use where dead trees are apt to become a menace to the visiting public. In the pure stands of susceptible aged trees, beetle control is of special importance to preserve an adequate forest cover and to avoid the fire hazard which an extensive area of dead forest is bound to create.

PRESENT CONDITIONS

The survey made by the writer from October 5 to 12 of this year, showed that in general the pine forests of the Park were quite free from epidemic beetle attacks.

The forests to the north, east, and west of the lake have been swept by the beetle epidemic and practically all of the susceptible trees have been killed. In some places this loss represents 90 per cent or more of the pine stand.

The units covered by control during the spring of 1930 were found to be in good shape and will not require any further treatment in the spring of 1931, except the Middle Fork-East Fork plateau unit which was not completed.

Two new areas of infestation were located, the source of which undoubtedly has been the uncontrolled Middle Fork-East Fork plateau infestation.

Table 4 shows the present distribution of the infestation in the south side areas and indicates the units still needing control.

THE SITUATION BY AREAS

The situation by areas is described below and the more important centers shown on the attached map.

Table No. 4
Estimated Attacks of Fall 1930
and Control Required Spring 1931

Area and unit	Unit Symbol	Acreage Susceptible Lodgepole	Trees per Acre	Total Infested Trees	Control Cost	Control Recommended
Sand Creek Area:						
(National Forest Area)						
South side unit	SS	2,000	.5	1,000	$ 750	In part
North side unit	SN	1,000	1.0	1,000	750	In part
Total Forest Area	SC	3,000		2,000	1,500	
(National Park Area)						
South Sand Creek	A,B,D,	3,500	.5	1,750	400	In part
North Sand Creek	C	1,600	.5	800	200	In part
Kerr Valley	E	1,600	1.0	1,600	1,000	In part
Total Park Area		6,700		4,150	1,600	
Sun Creek Area:						
Total		1,600	.3	480		No
Anna Creek Area:						
Munson Valley	F,K,L	700	.3	200	200	Yes
Anna Spring	G,H,X	500	.2	100	100	Yes
Pumice Flat	S	1,700	.3	510		No
Middle Fork-East Fk.	M	900	3.0	2,700	2,700	Yes
Crater Peak Ridge	R	2,100	1.5	3,200	3,200	Yes
South Entrance	J	1,100	2.0	2,200	2,200	Yes
Total Anna Creek Area		7,000		8,910	8,400	
Castle Creek Area:						
Cascade Divide	L	1,300	.2	260		No
White Horse	M, AM	400	.4	160		No
Castle Valley	O, BO	1,800	.3	540		No
Castle Ridge	P	900	.3	270		No
West Entrance	Q	2,200	.1	220		No
Total Castle Creek Area		6,600		1,450		
Total		24,900		16,990		
Total Area Recommended For Control						
National Forest Area		1,000		1,500	1,500	
National Park Area		6,900		10,000	10,000	

Sand Creek Area

This area was so thoroughly covered with control work in the spring of 1929, and such a good clean-up secured that no work was recommended for the spring of 1930. The present examination showed the area to be still in good condition. Over most of the area the 1930 loss would average less than one tree per acre with the distribution of trees averaging less than two trees per group.

On the National Forest area north of Sand Creek the infestation was slightly more aggressive with an average of 3 trees per group and more than one tree per acre. On this unit it was estimated that about 700 trees would need treatment on about 400 acres with 1000 trees on the entire unit. On the remainder of the area the infestation averaged about .5 trees per acre, but with the possibility that some heavier centers might require treatment in the spring of next year. An allotment of $1500 was requested of the Forester to take care of this work.

Within the Park most of the East Entrance unit was found to be in good condition with an infestation averaging less than .5 trees per acre, and very little clean up work necessary. However, on the Kerr Valley unit the infestation was found to be increasing rapidly. This unit was not covered as thoroughly as other parts of this area in the spring of 1929, and as a consequence reinfestation has developed rather quickly. This unit was listed for control in the 1930 plans but was not reached on account of the priority given to other units, and the lack of sufficient control funds. Now the infestation is aggressive and needs attention this coming spring. Some groups with 14 to 18 trees per group were found with an average of 9 trees per group. It is estimated that this infestation will run about 2 trees per acre for the pure pine stands involved.

Sun Creek Area

Lodgepole pine does not constitute an important tree in this basin, but occurs only as scattered trees and small groups mixed with fir and hemlock. No control work has ever been done in this area and although a few groups of infested trees can be found at present, they are not of sufficient importance to warrant control measures.

Anna Creek Area

The intensively used areas such as Anna Springs and Munson Valley are now practically free from infestation as a result of the continued control work. On account of the importance of these units, it is recommended that even a low intensity of infestation be treated to avoid further loss and the accumulation of dead trees.

On the Middle Fork-East Fork plateau, 1897 trees were not reached by the control work last spring. The beetles emerging from these trees have killed at least an equal number during the present fall and many have migrated to the east and infested the ridge south of Crater Peak. It is very important that this active center be completely cleaned up this coming spring.

The Crater Peak ridge unit is a newly infested area which was first affected in the fall of 1929. The source of this infestation is undoubtedly traceable to the uncontrolled Middle Fork-East Fork plateau unit which was discovered too late in the spring of 1929 to be completely treated before the beetles escaped, and which was not completely treated even in 1930. This unit represents a very active, aggressive type of infestation with groups averaging 13 trees per group and some with as many as 35 trees per group. It should be thoroughly treated this coming spring.

Further south along the Fort Klamath road is another area which has apparently absorbed some of the Middle Fork-East Fork plateau infestation. Groups of 14 to 20 trees were found with an average of 10 trees per group. While part of this area is in mixture with fir and hemlock there is considerable susceptible lodgepole and white pine which will be killed unless control is applied.

There is very little susceptible pine in Pumice Flat as most of the stand is too young to be attractive to the beetles.

The pine on the lower Munson plateau is now more than 75 per cent dead, so that it is no longer of interest to the beetles. Underneath this dead forest a fine stand of fir and hemlock reproduction is now developing.

Castle Creek Area

The lodgepole area above Anna Spring on the Cascade divide has a fairly heavy stand of susceptible pine but due to the control work this has been saved from destruction and the present infestation is very light.

Along the Medford road in the Whitehorse unit about fifty per cent of the pine was killed before the beetles were brought under control. The stand looks pretty thin now in places, but at least a partial ground cover has been preserved. The same condition prevails through most of the Castle Valley.

Further west along the Medford road there is a large area of young lodgepole which has grown up since a fire of the early 80's. It is still too young to be of interest to the beetles.

On the north Castle Creek the lodgepole stands have either been completely swept by the beetle epidemic or were too young to be affected. There is no danger of this area acting as a breeding place for beetles for many years to come.

RECOMMENDATIONS FOR THE COMING YEAR

Since the epidemic in the old centers is so nearly played out, the infestation on the treated units largely under control and only a few new centers of active infestation, there is no question but what the logical course to pursue at present is to vigorously push the control work to completion and clean up all of the present active centers.

For the spring of 1931, this will involve the treatment of the following units in order of their importance.

Unit	Status	Trees per acre	Total Trees To be treated
Middle Fork-East Fork Plateau	Unfinished	5.0	2,700
Crater Peak Ridge	New Unit	4.0	5,200
South Entrance	" "	2.0	2,200
Kerr Valley	Recleaning	1.0	1,000
East Entrance	"	.5	600
Munson Valley	"	.3	300
Anna Springs and Rim Areas	"	.2	100
	Total Trees		10,000

Total Cost of National Park Control Work	$10,000
Total Cost of National Forest Control Work	1,500

On account of the scattered character and inaccessibility of most of the infestation, it is estimated that the cost per tree will average somewhat higher than last year, and will probably amount to $1.00 per tree. An allotment of $10,000 is therefore indicated to complete the work on National Park areas during the spring of 1931, and $1,500 for the work on National Forest lands.

The completion of this work should leave the lodgepole stands in very good shape except for an endemic infestation which should be watched for a few years and controlled if it develops active characteristics.

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